

The University of Chicago

**AFFECTIVE, VOLITIONAL, AND
GALVANIC FACTORS IN
LEARNING**

A PART OF A DISSERTATION SUBMITTED TO
THE GRADUATE FACULTY IN CANDIDACY FOR
THE DEGREE OF DOCTOR OF PHILOSOPHY

DEPARTMENT OF PSYCHOLOGY

1930

By
EVA RUTH BALKEN

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AFFECTIVE, VOLITIONAL AND GALVANIC FACTORS IN LEARNING

BY EVA RUTH BALKEN

From the Psychological Laboratory of the University of Chicago

PROBLEM

The purpose of this investigation was to study the interrelationships of the following factors: (1) the affective value of the materials used in learning; (2) the volitional attitude assumed during learning; (3) the efficiency of learning; and (4) the galvanic skin deflections elicited upon the presentation of the materials.

The general method of approach to this problem was as follows: Subjects were presented with lists of words that contained paired associates of a pleasant, unpleasant, and indifferent character. They were instructed to assume either an active or a passive attitude while learning a list. Each list was presented but once, and recall followed immediately after presentation. The efficiency of learning was measured in terms of the number of items recalled and the speed of recall. Measures of the maximum magnitudes of the galvanic skin reflex deflections elicited during learning were obtained.

MATERIALS, PROCEDURE, AND APPARATUS

The materials used in this experiment differ from those used in other investigations in that the affective value of the paired associates was judged as a unit rather than as two words individually. In this way a greater range of affective value was secured. The word 'sores' in itself is unpleasant; combined with the verb 'suck' to form the paired associate 'suck sores,' the unpleasant tone is greatly intensified. The word 'sweetheart' alone has a pleasant connotation; combined with the verb 'embrace' in the paired associate 'embrace sweetheart' the pleasantness is enhanced. Through the use of such combinations the affective value was accumulative and stronger than if single words had been used.

Paired words, such as those cited above, were submitted to several students in Psychology in order to secure their judgments as to the affective value of each pair. From those upon which there was the greatest unanimity of judgment as to their unpleasant, pleasant, or indifferent character, was selected a number sufficient for the construction of 96 lists of 12 pairs each. In all, there were 1152 pairs, 384 each of pleasant, unpleasant, and indifferently toned paired associates.

The factor of position was eliminated by varying systematically the arrangement within a list so that each of the three types of paired associates occupied every position in a successive series of 3 lists, and by having the order of presentation for recall differ from that during learning.

Twenty subjects, students in elementary and advanced courses in Psychology, took part in the experiment. Each subject reported for 24 experimental sittings, at intervals, approximately, of 24 hours. Each sitting lasted from 20 to 45 minutes. Each subject was presented with four lists in a single session.

The regular experimental series was preceded by two practice sessions for the purpose of ascertaining the optimum interval of exposure for the lists, and of accustoming the subjects to the conditions of the experiment.

All the 20 subjects learned the series of 96 lists and in the same order. Each list was presented but once. The amount learned during the single presentation was then measured by testing for immediate recall. The number of items correctly recalled and the times of recall were recorded.

The subjects were instructed to assume, while learning a list, either of two attitudes—an active or a passive attitude. No suggestion was made as to which of the two attitudes might be conducive to more efficient learning. The subjects were warned at the beginning of an experimental session to maintain the prescribed attitude throughout the presentation of a list. Practice effect was equalized for the two attitudes by counterbalanced order: The two attitudes were alternated from list to list. Of the 4 lists learned in a single session, lists 1 and 3 were learned under one attitude and lists 2 and 4

under the other. Moreover, half the subjects began a series with one attitude, and the other half began the same series of 4 lists with the other. The conditions were reversed on the following day: those subjects who had begun the previous day's series with the passive attitude now began the series with the active attitude and vice versa.

The time of exposure of each pair in a list was two and one quarter seconds. An interval of two and one quarter seconds was allowed to elapse following the exposure so as to allow for the subsiding of any galvanic skin reflex deflections that may have been elicited.

The lists were exposed by means of a Hull Memory Drum, which controls automatically the time of exposure and the interval elapsing between two successive exposures. The drum was mounted on the table in front of the subject at a distance convenient for clear vision.

The times of recall were recorded by means of a stop watch showing fifths of a second.

The galvanic skin reflex deflections elicited by the paired associates during their presentation were obtained by placing the subject in circuit with the Hathaway Psychogalvanic Response Apparatus, the electrodes being bound against the palm of the right hand. This apparatus was mounted on the table to the right of the subject and out of the line of his direct vision.

Through the use of alternating current as electrode potential, the Hathaway apparatus eliminates, professedly, polarization, even with the use of dry electrodes. Through the use of a milliammeter, in place of the usual galvanometer, immediate recording of the magnitude of the deflections in terms of the excursions of the marker to the right on the milliammeter scale is made possible. Readings are in hundredths of a milliammeter.

Only those galvanic skin reflex deflections elicited upon presentation of the materials during learning were recorded. It was not feasible to record them during recall inasmuch as the recording of the number of items correctly recalled and the times of recall occupied the experimenter's entire time.

It was not possible to attach either a kymographic or a photographic device to the apparatus. So, no attempt was made to record either the time elapsing before a deflection reached its maximum or the duration of a deflection. The measures of the deflections were invariably in terms of their maximum magnitude.

PART I. INFLUENCE OF AFFECTIVE VALUE OF MATERIALS
UPON EFFICIENCY OF LEARNING AND GALVANIC SKIN
REFLEX DEFLECTIONS

The results of this phase of the experiment are given in Tables I and II. Table I summarizes the findings with regard to the influence of the affective value of the materials upon the amount and speed of recall. Table II summarizes the findings with regard to the influence of the affective value of the materials upon the number and maximum magnitude of the galvanic skin reflex deflections elicited upon their presentation during learning. The results of the 20 subjects taking part in the experiment form the basis of the calculations.

TABLE I
AVERAGE NUMBER OF ITEMS RECALLED PER LIST AND AVERAGE TIME PER
ITEM RECALLED

Affective Value	No. per List	Aver. No. Recalled	σ (dis.)	Total No. Recalled	Aver. Time in Seconds	σ (dis.)
Pleasant.....	4	2.95	1.579	5655	1.87	1.093
Unpleasant.....	4	2.91	1.044	5590	1.89	1.114
Indifferent.....	4	2.92	1.065	5605	1.85	1.114

These figures indicate that the differences in the average number and average time of recall of pleasant, unpleasant, and indifferent items are quite small; a computation of the probable error of the differences showed that they are unreliable. We must conclude, therefore, that the effective value of the materials did not influence either the amount or speed of recall.

These results are in accord with the findings of Wohlge-muth (25) and of Gordon (9), who, however, did not measure

the speed of recall. They are not in agreement with the findings of others. An explanation for the variance of results may be sought in terms of the conditions of the several experiments as compared with those of this study. Peters (16), Peters and Nemecek (17), and Henderson (11), for example, found that unpleasantly toned experiences were recalled less often than either pleasantly or indifferently toned experiences; and Baxter, Yamada, and Washburn (1) found that a longer reaction time was required for recalling unpleasant experiences. These investigators used the method of directed recall. That is, they required their subjects either to react to a stimulus word with the memory of an actual personal experience or merely to list personal experiences and then to classify them with regard to their affective tone. In this manner, they practically approximated the conditions that held in Freud's investigations. At the same time, however, they left uncontrolled the interfering factors of the probable difference in the number of such experiences, in the intensity with which they were originally fixated and acquired, and in the relative recency or remoteness of their occurrence. They seem to tacitly postulate that pleasant, unpleasant and indifferent experiences occur with equal frequency and equal intensity, and that remote and recent experiences are recalled equally often. Also they did not obviate the possibility that their subjects may have actually recalled many unpleasant experiences, but were reluctant to admit them in either verbal or written statements. Further, and obviously, the experiences listed were not acquired originally with the intention of subsequent recall. It may be noted here that Wohlgemuth (25), using this same method of directed recall and controlling the interfering factors of the probable difference in recency or remoteness and number of pleasant and unpleasant experiences, obtained results with which the findings of the present investigation are in accord. In view of the variances in method of the several investigators, we are precluded from making direct comparisons with any study other than that of Gordon (9).

It may be observed that the figures of the three types of

TABLE II

AVERAGE NUMBER OF DEFLECTIONS ELICITED PER LIST AND AVERAGE MAXIMUM MAGNITUDE PER DEFLECTION ELICITED

Affective Value	Aver. No. Elicited per List	σ (dis.)	Total No. Elicited	Aver. Max. in Milliammeters per Deflection	σ (dis.)
Pleasant.....	.684	1.027	1315	.0297	.0182
Unpleasant.....	.596	.936	1145	.0268	.0194
Indifferent.....	.648	.968	1244	.0278	.0189

material are almost identical, showing no effect of the affective value of the materials upon either the frequency or maximum magnitude of the deflections elicited. A computation of the probable errors revealed no significant differences between the pleasant, unpleasant, and indifferent items. Washburn and Pisek (24) in Galvanometer Experiments with Revived Emotions as a Test of Emotional and Phlegmatic Temperaments obtained similar results.

PART II. INFLUENCE OF CONDITION OF LEARNING UPON EFFICIENCY OF LEARNING AND GALVANIC SKIN REFLEX DEFLECTIONS

This phase of the experiment was concerned with the influence of the active and passive attitudes assumed while learning a list upon the number of items recalled and the speed of their recall, and upon the number of deflections elicited during the presentation of the paired associates and their maximum magnitude. The results appear in Tables III, IV, V, VI, VII, and VIII.

TABLE III

AVERAGE NUMBER OF ITEMS RECALLED PER LIST AND AVERAGE TIME PER ITEM RECALLED

Learning Condition	No. per List	Aver. No. Recalled per List	σ (dis.)	Total No. Recalled	Aver. Time in Seconds	σ (dis.)
Active.....	12	10.01	1.687	9613	1.84	1.102
Passive.....	12	7.54	2.298	7237	1.92	1.109

These figures indicate a difference in the efficacy of the two conditions of learning. The active condition is shown to

be decidedly the better, as far as amount of recall is concerned, and somewhat better, as far as speed of recall is concerned. A computation of the probable errors of the differences with regard to amount showed them to be reliable. The reliability of the difference is indicated further by an inspection of the results for the individual subjects (see Table IV). A computation of the probable error of the difference with regard to speed showed it to be insignificant. Further indication of the probable statistical insignificance of this difference may be gained from an analysis of the results for the individual subjects (see Table V). We may conclude, then, that the active condition of learning facilitated the efficiency of learning when the measure of efficiency was the amount recalled. Earlier investigators, with the exception of Fukuya (8), obtained results with which those of the present experiment are in accord. However, even Fukuya's results indicate some

TABLE IV
AVERAGE NUMBER OF WORDS RECALLED PER LIST

Name	Active Attitude	Passive Attitude	Difference	
			More Gain with Active	Percent More with Active Attitude
Ca.	9.25	7.56	1.69	22
Da.	10.06	8.65	1.41	16
Fi.	10.00	6.64	3.36	51
Fs.	10.96	8.31	2.65	32
Ha.	9.44	7.29	2.15	29
He.	10.08	8.06	2.02	25
Ho.	10.46	8.23	2.23	27
Hw.	9.90	7.04	2.86	41
Is.	9.96	7.19	2.77	39
Ma.	8.60	5.29	3.31	62
Ob.	10.11	7.63	2.48	33
Pa.	10.48	8.17	2.31	28
Si.	10.08	7.10	2.98	42
Sm.	10.29	8.35	1.94	23
Su.	10.11	8.15	1.96	24
Ue.	10.36	8.27	2.09	25
Vo.	9.35	7.15	2.20	31
Wh.	10.11	7.27	2.84	39
Wm.	10.17	6.83	3.34	50
Wo.	10.54	7.58	2.96	38
Average.	10.01	7.54	2.47	33

N—Individuals—48.

N—Group—960.

margin of superiority in favor of more efficient mental work when the active attitude was assumed, for he notes, that on the whole, the active attitude was more efficient for short periods of work and at the beginning of work.

TABLE V
AVERAGE TIME PER ITEM RECALLED
(In Seconds)

Name	Active Attitude	Passive Attitude	Difference	
			Longer with Active Attitude	Longer with Passive Attitude
Ca.....	2.18	2.32		.14
Da.....	1.79	1.84		.05
Fi.....	1.41	1.49		.08
Fs.....	1.89	2.17		.28
Ha.....	2.44	2.47		.03
He.....	1.47	1.48		.01
Ho.....	1.81	1.76	.05	
Hw.....	2.03	1.94	.09	
Is.....	1.47	1.67		.20
Ma.....	2.00	2.13		.13
Ob.....	1.96	1.90	.06	
Pa.....	1.45	1.65		.20
Si.....	1.80	1.81		.01
Sm.....	1.79	1.68	.11	
Su.....	1.76	1.62	.14	
Ue.....	1.95	1.97		.02
Vo.....	2.86	2.78	.08	
Wh.....	1.60	1.79		.19
Wm.....	1.78	2.39		.61
Wo.....	1.49	1.68		.19
Average.....	1.84	1.92		.08

N—Individuals—254 to 526.

N—Group—9613 (Active)—7237 (Passive).

The figures in Table VI reveal a difference between the influence of the two conditions of learning upon the frequency and extent of the galvanic skin reflex deflections elicited during

TABLE VI
AVERAGE NUMBER OF DEFLECTIONS ELICITED PER LIST AND AVERAGE MAXIMUM
MAGNITUDE PER DEFLECTION ELICITED

Learning Condition	Aver. No. Elicited per List	σ (dis.)	Total No. Elicited	Aver. Max. in Milliammeters per Deflection	σ (dis.)
Active.....	3.06	2.475	2936	.0302	.0229
Passive.....	.80	1.268	768	.0203	.0151

the presentation of the materials—galvanic skin reflex deflections were elicited more frequently under the active condition and their maximum magnitude was greater under this condition. A computation of the probable errors of these differences showed the differences to be reliable. Their reliability is further indicated by an inspection of the averages for the individual subjects (see Tables VII and VIII). Several earlier studies, not precisely concerned with this phase of the problem of our experiment, indicate that increased mental activity is accompanied by increased deflections of the galvanic skin reflex and thus, apparently, give indirect support to the findings of this study. Starch (21), for example, in an investigation of "Mental Processes and Concomitant Galvanometric Changes," found that mental activity accompanied by physical activity and also voluntary mental activity produce larger galvanic skin reflex deflections than does automatic mental activity. In an investigation of the supposed emotional significance of the psychogalvanic reflex, Brown (5) obtained only negative results, but was able to show that qualities which have an element of 'will' in the sense of consciously directed activity, correlated most highly with the galvanic reflex, and that those qualities having a predominantly emotional aspect all had low correlations with the reflex.

PART III. INFLUENCE OF AFFECTIVE VALUE AND CONDITION OF LEARNING UPON EFFICIENCY OF LEARNING AND GALVANIC SKIN REFLEX DEFLECTIONS

The figures in Tables I and II showed that the affective value of the materials did not affect either the amount and speed of recall or the number and magnitude of galvanic skin reflex deflections elicited during learning. The figures in Tables III, IV, V, VI, VII and VIII, on the other hand, revealed that the attitude assumed during the presentation of the lists of paired associates did influence these measurements. It was found that under the active condition of learning the amount and speed of recall was greater and also the number and maximum magnitude of deflections than under the

TABLE VII
AVERAGE NUMBER OF DEFLECTIONS ELICITED PER LIST

Name	Active Attitude	Passive Attitude	Difference	
			More with Active Attitude	Percent More with Active Attitude
Ca.....	3.83	1.23	2.60	211
Da.....	4.00	1.13	2.87	254
Fi.....	2.54	.38	2.16	567
Fs.....	2.69	.79	1.90	241
Ha.....	3.10	.75	2.35	313
He.....	2.33	.54	1.79	331
Ho.....	2.73	.73	2.00	274
Hw.....	3.00	.57	2.43	426
Is.....	2.96	.57	2.39	419
Ma.....	2.10	.46	1.64	357
Ob.....	2.15	.52	1.63	313
Pa.....	3.98	.57	3.41	598
Si.....	3.52	1.00	2.52	252
Sm.....	3.46	.92	2.54	276
Su.....	3.40	1.08	2.32	215
Ue.....	2.27	.92	1.35	147
Vo.....	2.83	.92	1.91	208
Wh.....	4.00	1.10	2.90	264
Wm.....	3.19	.94	2.25	240
Wo.....	3.08	.92	2.16	235
Average.....	3.06	.80	2.26	283

N—Individual—48.

N—Group—960.

TABLE VIII
AVERAGE MAXIMUM MAGNITUDE PER DEFLECTION ELICITED
(In Millimeters)

Name	Active Attitude	Passive Attitude	Difference	
			Larger with Active Attitude	Percent Larger with Passive Attitude
Ca.....	.0296	.0181	.0115	64
Da.....	.0305	.0194	.0106	55
Fi.....	.0316	.0200	.0116	58
Fs.....	.0362	.0150	.0212	141
Ha.....	.0298	.0256	.0042	16
He.....	.0325	.0170	.0155	91
Ho.....	.0349	.0294	.0055	19
Hw.....	.0319	.0163	.0156	96
Is.....	.0382	.0207	.0175	85
Mo.....	.0246	.0136	.0110	81
Ob.....	.0301	.0208	.0093	45
Pa.....	.0314	.0278	.0036	13
Si.....	.0352	.0204	.0148	73
Sm.....	.0293	.0225	.0068	31
Su.....	.0285	.0252	.0033	13
Ue.....	.0302	.0236	.0066	28
Vo.....	.0328	.0168	.0160	95
Wh.....	.0285	.0234	.0051	22
Wm.....	.0196	.0122	.0074	61
Wo.....	.0198	.0168	.0030	18
Average.....	.0302	.0203	.0099	49

N—Group—2936. 768.

passive attitude. The question now arises as to whether an analysis of the data for the active and passive conditions separately will disclose that learning efficiency and galvanic skin reflex deflections were influenced by the affective value of the materials. For the answer to this question, we may refer to Tables IX, X, XI, and XII.

TABLE IX

AVERAGE NUMBER OF ITEMS RECALLED PER LIST AND AVERAGE TIME OF RECALL PER ITEM RECALLED UNDER THE ACTIVE CONDITION OF LEARNING

Affective Value	No. per List	Aver. No. Recalled per List	σ (dis.)	Total No. Recalled	Aver. Time in Seconds	σ (dis.)
Pleasant.....	4	3.352	.809	3218	1.872	1.127
Unpleasant.....	4	3.332	.818	3199	1.856	1.074
Indifferent.....	4	3.329	.847	3196	1.752	1.076

TABLE X

AVERAGE NUMBER OF ITEMS RECALLED PER LIST AND AVERAGE TIME OF RECALL PER ITEM RECALLED UNDER THE PASSIVE CONDITION OF LEARNING

Affective Value	No. per List	Aver. No. Recalled per List	σ (dis.)	Total No. Recalled	Aver. Time in Seconds	σ (dis.)
Pleasant.....	4	2.538	.850	2437	1.873	1.050
Unpleasant.....	4	2.490	1.076	2391	1.938	1.116
Indifferent.....	4	2.509	1.089	2409	1.941	1.158

TABLE XI

AVERAGE NUMBER OF DEFLECTIONS ELICITED PER LIST AND AVERAGE MAXIMUM MAGNITUDE PER DEFLECTION ELICITED UNDER THE ACTIVE CONDITION OF LEARNING

Affective Value	Aver. No. Elicited per List	σ (dis.)	Total No. Elicited	Aver. Max. in Millimeters per Deflection	σ (dis.)
Pleasant.....	1.086	1.210	1043	.0317	.0364
Unpleasant.....	.962	1.100	924	.0285	.0352
Indifferent.....	1.009	1.110	969	.0302	.0389

Tables IX, X, XI and XII show that the attitude assumed during learning did not exert a discriminating influence upon the nature and the degree of the affect of the affective value of the materials upon either learning efficiency or galvanic

TABLE XII

AVERAGE NUMBER OF DEFLECTIONS ELICITED PER LIST AND AVERAGE MAXIMUM
MAGNITUDE PER DEFLECTION ELICITED UNDER THE ACTIVE
CONDITION OF LEARNING

Affective Value	Aver. No. Elicited per List	σ (dis.)	Total No. Elicited	Aver. Max. in Milliam- meters per Deflection	σ (dis.)
Pleasant.....	.283	.566	272	.0221	.0315
Unpleasant.....	.230	.524	221	.0196	.0295
Indifferent.....	.286	.512	275	.0191	.0269

skin reflex deflections. The differences between the results for the three types of materials as they appear in the tables are quite small; a computation of the probable errors showed these differences to be unreliable.

PART IV. RELATION OF EFFICIENCY OF LEARNING AND GALVANIC SKIN REFLEX DEFLECTIONS

In order to ascertain whether there is an actual association between efficiency of learning and galvanic skin reflex deflections, and, at the same time, to rule out the factor that all items that were recalled did not elicit deflections during their presentation, we used the Contingency Method developed by Pearson. The fundamental principle underlying the method is a comparison of the frequency of association actually found in an investigation with the frequency we should expect to find if the variables being studied were completely unrelated, that is, through a chance relationship alone. Table XIII summarizes the values that were actually obtained in this experiment and the values that would have held through chance alone.

TABLE XIII

Values	Average with De- flections Recalled	Average with De- flections not Recalled	Average without Deflections Recalled	Average without Deflections not Recalled
Actually obtained.....	145	40	698	269
Obtained through chance.....	136	49	707	260

These figures indicate that the frequency with which recall and galvanic skin reflex deflections were actually related

differed only slightly from the frequency with which they were related through chance. We must conclude, therefore, that the fact that an item elicited a deflection during its presentation did influence the possibility of its being recalled more readily than if it had not elicited a galvanic skin reflex reaction.

SUMMARY

The purpose of this investigation was to study the interrelationships of the following factors: (1) the affective value of the materials used in learning; (2) the volitional attitude assumed during learning; (3) the efficiency of learning; and (4) the galvanic skin reflex deflections elicited upon the presentation of the materials. The general method of approach to this problem was as follows: Subjects were presented with lists of words that contained paired associates of a pleasant, unpleasant, and indifferent character. They were instructed to assume either an active or a passive attitude while learning a list. Each list was presented but once, and recall followed immediately after presentation. The efficiency of learning was measured in terms of the number of items recalled and the speed of recall. Measure of the maximum magnitudes of the galvanic skin reflex deflections elicited during learning were obtained. The findings of this investigation were that: (1) the affective value of the materials did not influence either the efficiency of learning or the galvanic skin reflex deflections elicited during learning; (2) the active condition of learning was more efficient with regard to both the amount and speed of recall and the amount and magnitude of galvanic skin reflex deflections elicited; (3) the affective value of the materials still failed to exert any influence when the data for the active and passive conditions were analyzed separately; and (4) there was no relationship between the galvanic skin reflex deflections and efficiency of learning.

REFERENCES

1. BAXTER, YAMADA, AND WASHBURN, Directed recall of pleasant and unpleasant circumstances, *Amer. J. of Psychol.*, 1917, 28, 155-157.
2. BILLS, A. J., The influence of muscular tension on the efficiency of mental work, *Amer. J. of Psychol.*, 1927, 38, 227-251.

3. BOOK, W., AND NORVELL, L., The will to learn, an experimental study of learning incentives, *Ped. Sem.*, 1922, **29**, 305-362.
4. BOSWELL, F., AND FOSTER, W., On memorizing with intention to permanently retain, *Amer. J. of Psychol.*, 1916, **27**, 420-431.
5. BROWN, W. S., A note on the psycho-galvanic reflex in conjunction with estimates of character qualities, *Brit. J. of Psychol.* (Gen. Sect.), 1925-1926, **16**, 130-135.
6. COLGROVE, G. W., Individual memories, *Amer. J. of Psychol.*, 1898, **10**, 228-255.
7. FREUD, S., *The Psychopathology of Everyday Life*. Macmillan Co., 1893.
8. FUKUYA, S. M., An experimental study of a tention from the standpoint of mental efficiency, *Psychol. Rev.* (Monog. Suppl.), 1917, No. 25.
9. GORDON, K., Ueber das Gedaehtnis fuer affektiv bestimmte Eindruecke. *Arch. f. d. ges. Psychol.*, 1905, **4**, 437-458.
10. GRIFFITS, K., Results of some experiments on affection, distribution of association and recall, *J. Exper. Psychol.*, 1920, **3**, 447-464.
11. HENDERSON, F. N., Do we Forget the disagreeable?, *Jour. of Phil., Psychol., and Science*, 1910, **8**, 432-438.
12. HOLLINGWORTH, H. L., The oblivescence of the disagreeable, *Jour. of Phil., Psychol., and Science*, 1910, **7**, 709-714.
13. KIRKPATRICK, E. A., An experiment in memorizing vs. incidental learning, *J. Ed. Psychol.*, 1914, **4**, 405-414.
14. MYERS, G. S., A study in incidental memorizing, *Arch. of Psychol.*, 1913, **21**, No. 26.
15. MYERS, G. S., Affective factors in recall, *Jour. of Phil., Psychol., and Science*, 1915, **12**, 85-92.
16. PETERS, W., Gefuehl und Erinnerung, Beitrage zur Erinnerungsanalyse, *Psychol. Arbeiten*, 1911, **6**, 197-260.
17. PETERS, W., AND NEMECEK, O., Massenversuche ueber Erinnerungsassoziationen, *Fortschritte der Psychol. und ihrer Anwendungen*, 1914, **2**, 226-245.
18. PETERSON, J., The effect of attitude on immediate and delayed report *J. of Ed. Psychol.*, 1916, **7**, 523-551.
19. SMITH, M., AND McDUGALL, W., Some experiments in learning and retention, *Brit. J. of Psychol.*, 1920, **10**, 199-209.
20. SMITH, W. W., *The Measurement of Emotion*. Harcourt Brace, New York, 1922.
21. STARCH, D., Mental processes and concomitant galvanometric changes, *Psychol.*, 1910, **17**, 19-36.
22. STEVANOVIC, B. P., An experimental study of the mental processes involved in judgment, *Brit. J. of Psychol.* (Monog. Suppl.), 1927, **4**, 1-138.
23. TAIT, W. D., The effect of psychophysical attitudes on memory, *J. Abn. Psychol.*, 1918, **29**, 187-195.
24. WASHBURN AND PISEK, Galvanometer experiments with revived emotions as a test of emotional and phlegmatic temperaments, *Amer. J. of Psychol.*, 1925, **36**, 459-460.
25. WOHLGEMUTH, A., The influence of feeling on memory, *Brit. J. of Psychol.* (Gen. Sect.), 1923, **13**, 405-416.
26. WOHLGEMUTH, A., Simultaneous and successive association, *Brit. J. of Psychol.*, 1914-1915, **7**, 434-452.
27. WOODWORTH, R. S., A revision of imageless thought, *Psychol. Rev.*, 1915, **22**, 1-27.

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